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ORIGINAL RESEARCH

Lesbian, Gay, Bisexual, and Transgender Health: a Survey of Attitudes, Knowledge, Preparedness, Campus Climate, and Student Recommendations for Change in Four Midwestern Medical Schools

Gary L. Beck Dallaghan[1] · Jim Medder[2] · Jeffrey Zabinski[3] · Sabrina M. Neeley[4] · Brenda Roman[5] · Jeffrey L. Emrich[6] · Nicole Borges[7] · Dawn Bragg[8]

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Abstract

Medical school curricula addressing the unique healthcare needs and disparities of lesbian, gay, bisexual, and transgender (LGBT) patients are insufficient. National organizations have recommended curricular and institutional climate changes to address this problem. This study examined students' perceived attitudes and knowledge regarding LGBT patient care and campus climate at four Midwestern US allopathic medical schools. During 2013, all medical students at the four institutions were invited to participate in the online anonymous survey. We used descriptive statistics for survey item results and qualitative methods to analyze responses to open-ended questions about curricular changes. Survey results were obtained from 34.6% of students and demonstrated that attitudes, knowledge, preparedness, and campus climate across all institutions were generally positive for LGBT patients and students. A negative correlation was found between overall campus climate and discrimination practices. Four themes emerged from students' recommendations to improve their training, which included more clinical experiences with LGBT patients, more formal curricula on LGBT topics, establishment of safe learning environments, and addition of specific topics related to LGBT health. Due to the low prevalence of LGBT populations, reluctance to disclose sexual orientation or gender identity, and lack of LGBT-specific clinics, required experiences with LGBT patients during clinics or clerkship rotations may be more difficult in smaller urban communities in which some Midwestern medical schools are located. Potential alternatives include using multiple teaching modalities in the pre-clerkship years to expose students to LGBT-identified patients in clinical simulations and settings.

Keywords Lesbian · Gay · Bisexual · Transgender · LGBT · Patient care · Attitudes · Knowledge · Medical education

Introduction

To prepare students to be exceptional physicians, institutions must provide comprehensive culturally competent clinical skills training across a diverse spectrum of populations, including gender and sexual minorities. Lesbian, gay, bisexual, and transgender (LGBT) individuals have unique healthcare needs associated with discrimination by society in general and

✉ Gary L. Beck Dallaghan
gbeck@unmc.edu

[1] Office of Medical Education, College of Medicine, University of Nebraska Medical Center, 985525 Nebraska Medical Center, Omaha, NE 68198-5525, USA

[2] Family Medicine, College of Medicine, University of Nebraska Medical Center, Omaha, NE, USA

[3] Psychiatry Residency, Johns Hopkins School of Medicine, Baltimore, MD, USA

[4] Population and Public Health Sciences, Boonshoft School of Medicine, Wright State University, Dayton, OH, USA

[5] Psychiatry, Boonshoft School of Medicine, Wright State University, Dayton, OH, USA

[6] Pre-Clinical Curriculum, Carver College of Medicine, University of Iowa, Iowa City, IA, USA

[7] Pediatrics, University of Mississippi School of Medicine, Jackson, MS, USA

[8] Student Affairs/Diversity, Office of Measurement and Evaluation, Pediatric-Medical Education, Medical College of Wisconsin, Milwaukee, WI, USA

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healthcare providers and healthcare systems in particular. To manage the stress from this discrimination, LGBT individuals tend to adopt unhealthy behaviors, avoid healthcare visits for preventive services and routine care, and when they do receive medical care, to conceal their gender identity/transgender status and sexual orientation from clinicians [1–4]. In addition, the discrimination (harassment and isolation) faced by LGBT medical students and physicians from their peers can lead to a lower sense of well-being, including depression and anxiety [5–8].

Addressing healthcare disparities in the LGBT population has recently become a greater priority for various agencies, including the Institute of Medicine, Healthy People 2020, and the Joint Commission [1, 9, 10]. The Association of American Medical Colleges (AAMC) has also recommended curricular and institutional climate changes for sexual and gender minorities [11]. These recommendations accompany studies that have identified gaps in medical education on sexual orientation and gender identity, such as the2009–2010 survey of allopathic and osteopathic schools in the USA and Canada that revealed a median of 5 h (mean of 6.5 h) of LGBT-related instruction. The LGBT curricular content was described by the education deans of many of the schools as insufficient and greatly variable among institutions [12].

Other studies revealed medical student perspectives on LGBT patients and healthcare, including their preparedness and comfort in caring for LGBT patients. A study of heterosexual first year medical students revealed that almost half expressed explicit bias and over four fifths had some implicit bias against gays and lesbians; these biases decreased with more exposure to LGBT persons [13]. While the acceptance of LGBT individuals is greater among Millennials than older generations [14], one study of medical students showed only small decreases in episodes of bias for those of LGB sexual orientation over a 12-year period [15]. Another study in 2008 revealed that 25% of medical student respondents had witnessed disparaging remarks or offensive behaviors against LGBT individuals during their training [16]. In a 2015 survey of healthcare students in the USA and Canada, about two thirds assessed their schools' content as "fair" or lower, especially in transgender content; overall, students felt comfortable with LGBT patients but not fully prepared to provide care [17]. Curriculum interventions to improve LGBT training, including exposures to LGBT patients, have shown at least short-term improvements in knowledge and comfort at several schools [18–23].

National surveys, however, may not reflect regional differences, such as those that may exist at schools in the Midwestern USA, where conservative beliefs and attitudes are perceived to be more prevalent and where exposure to LGBT individuals may be more limited. In 2014, the Williams Institute averaged social climate indices for states into indices for regions. Their index is based on four measures of attitudes and beliefs about LGBT people: same-sex marriage, adoption rights, protection against employment discrimination, and belief that homosexuality is a sin. The Midwest index of 59 is lower than those for the Pacific (68) and Northeast (71) regions but higher than those for the Mountain (56) and South (55) regions (the higher the index, the greater the acceptance) [24].

This study sought to examine student attitudes, knowledge, and preparedness regarding LGBT patients and the provision of their health care, and campus climate or learning environment for LGBT students in four Midwestern US medical schools, a region that has not been adequately studied. We also compared the individual institutions to determine if students at those institutions with more required formal curricula and LGBT patient exposures had greater knowledge and more positive attitudes toward LGBT patients and more accepting learning environments for LGBT students. Finally, curricular interventions to address gaps were also identified by student respondents.

Methods

Survey Sample

The population invited to participate in the survey included all 2214 medical students enrolled at four Midwestern allopathic medical schools between January and May 2013. These four medical schools were selected based on the interest of faculty from these institutions in the goals of this study and their availability to participate. The number of students at each institution were as follows: University of Iowa, 450; Wright State University, 444; University of Nebraska Medical Center, 520; and Medical College of Wisconsin, 800. We obtained ethical approval to recruit participants by the Institutional Review Boards at each collaborating school. Using institutional email lists of all students, emails with a link to the online anonymous survey and an explanation of the purpose of the survey were sent to all students at each institution by faculty with administrative roles and who were known to the students at their respective institutions. A follow-up email reminder was sent to all students 2 weeks later; closure of the survey occurred 2 weeks after sending the reminder.

Survey Instrument

The survey consisted of questions assessing the attitude, knowledge, and preparedness of students in caring for LGBT patients and campus climate for LGBT students. The attitude section included 21 statements, the knowledge section contained five statements, and the preparedness section had four (see Table 2 for list of items). Nine of the attitude items and the five knowledge items were previously validated and

were used with permission from a prior study [18]. Campus climate questions were adapted from the AAMC Graduate Questionnaire items regarding student mistreatment to determine the source of the bias by asking who exhibited such behaviors (medical students, faculty, staff, or other health professionals). The remaining questions were developed by the authors of this study and were not previously validated. Responses to attitude, knowledge, and preparedness items were rated from 1 (strongly disagree) to 5 (strongly agree) while campus climate items were rated from 1 (very hostile) to 5 (very accepting). Finally, participants were asked to respond to two open-ended questions asking for recommendations for curricular change to better prepare them to take care of LGBT patients.

LGBT Curriculum Inventory

We inventoried each institution for required and elective learning opportunities (by number of contact hours), types of LGBT patient exposures and instructional methods, and whether the curriculum was offered in preclinical years or clinical years. This data was gathered by the co-authors, who have integral roles in the curriculum offices at their institutions. We compared campuses by number of hours of LGBT required curriculum with their overall campus environments (attitudes and bias) and level of knowledge and preparedness to care for LGBT patients.

Analysis

We calculated descriptive statistics to categorize individual item data for all students from the four institutions. Analysis of variance and Pearson's correlations were used to examine relationships among continuous variables. Chi-square analyses were conducted for categorical variables. Analyses were done with SPSS® Statistics v24 (IBM, Chicago, IL).

Open-ended responses about curricular changes were analyzed by two of the authors (GLBD and NB), and initial thematic codes were identified. The two authors discussed the codes and combined similar topics. Using this version of the codebook, the comments were independently coded. Where coding was incongruent, the authors discussed the differences and came to consensus on a final code. Finally, coded themes were grouped into overarching themes.

Results

Demographics

A total of 766 students participated in the survey for an overall response rate of 34.6% (Table 1). The mean age was similar among the four institutions. Overall, 52.0% of the respondents were men, a total of 93.4%were heterosexual, and Caucasians accounted for 77.9%. Distinct orientation by each of the four self-identified categories did not meet expected frequencies in 50% of cells; therefore, we grouped categories into those who self-identify as heterosexual vs. those who do not. There was a significant relationship between school and orientation ($\chi^2(3) = 11.493$, $p = 0.009$). UI has a higher percentage of students who self-identify as "homosexual," "bisexual," or "other" than would be expected by chance, while UNMC has a much lower percentage of students who self-identify into one of those categories than would be expected by chance.

Table 2 lists means of individual items for attitudes, knowledge, and preparedness for all students at the four institutions.

Attitudes

The results generally reflected a positive acceptance in student responses to the 21 attitude questions. The items with the highest average positive response included the following: comfort treating LGBT patients (4.69), working with LGBT colleagues (4.66), and having a personal physician who is LGBT (4.45); comfort with family member disclosing his/her orientation (4.26); effectiveness of same-sex parenting (4.11); and beliefs being affected by LGBT experiences (4.10). On average, participants disagreed or strongly disagreed with statements related to believing that LGBT people have a mental illness (1.21) or are immoral (1.71) and preferring not to treat patients with minority sexual orientation (1.30) or gender identity issues (1.45).

Further investigation of the attitude questions by university demonstrated statistically significant differences for the previously mentioned items. Specifically, comfort treating LGBT patients was significantly different between UI (4.79) and WSU (4.51) ($F(3,752) = 5.949$, $p = .018$). For comfort working with LGBT colleagues, WSU had a significantly lower rating than the other three schools ($F(3,753) = 4.612$, $p = .003$). Having a personal physician who identifies as LGBT was more highly rated by UI students over the other schools ($F(3,751) = 5.939$, $p = .001$). Significant differences were noted for the following items: believing LGBT people have a mental illness ($F(3,575) = 6.705$, $p = .000$); preferring not to treat patients with minority sexual orientation ($F(3,749) = 6.705$, $p = .016$) or gender identity issues ($F(3,572) = 3.534$, $p = .015$). WSU and UNMC did not disagree to the same degree as UI or MCW for these items; however, their mean responses were at or less than 2, which indicates they did disagree with those statements.

Knowledge

The highest levels of perceived knowledge recognizing the importance of knowing patients' sexual orientation, practices,

Table 1 Characteristics of survey participants by institution

	All	UI	WSU	UNMC	MCW
Response rate (*n*, population, %)					
	766	187	58	236	285
	2214	450	444	520	800
	(34.6%)	(24.4%)	(7.6%)	(30.8%)	(37.2%)
Age (mean, SD)					
	25.5 (3.0)	25.8 (3.2)	25.8 (5.5)	25.4 (2.7)	25.4 (2.6)
Gender (*n*, %)					
Female	341 (48.0%)	65 (39.2%)	24 (46.2%)	113 (52.6%)	139 (50.2%)
Male	369 (52.0%)	101 (60.8%)	28 (53.8%)	102 (47.4%)	138 (49.8%)
Sexual orientation (*n*, %)					
Heterosexual	665 (93.4%)	147 (88.6%)	48 (92.3%)	209 (97.2%)	261 (93.5%)
Homosexual	24 (3.4%)	8 (4.8%)	2 (3.8%)	4 (1.9%)	10 (3.6%)
Bisexual	16 (2.2%)	9 (5.4%)	2 (3.8%)	2 (0.9%)	3 (1.0%)
Other or not identified	7 (1.0%)	2 (1.2%)	0 (0%)	0 (0%)	5 (1.8%)
Ethnicity (*n*, %)					
African-American	28 (3.9%)	4 (2.4%)	7 (13.5%)	2 (0.9%)	15 (5.4%)
Caucasian	552 (77.9%)	125 (75.8%)	35 (67.3%)	190 (89.2%)	202 (72.4%)
Asian	64 (9.0%)	17 (10.3%)	5 (9.6%)	13 (6.1%)	29 (10.4%)
Latino/Latina	16 (2.3%)	7 (4.2%)	0 (0%)	2 (0.9%)	7 (2.5%)
Mixed	33 (4.7%)	9 (5.5%)	3 (5.8%)	4 (1.9%)	17 (6.1%)
Other	16 (2.3%)	3 (1.8%)	2 (3.8%)	2 (0.9%)	9 (3.2%)

All all four institutions, *UI* University of Iowa, *WSU* Wright State University, *UNMC* University of Nebraska Medical Center, *MCW* Medical College of Wisconsin

and gender identity (4.34) and the unique health risks and needs of LGBT patients (4.22). Analysis of these items by university indicated a significant difference in mean rating by UI (4.40) with WSU (4.08) ($F(3,716) = 2.681$, $p = .046$) for recognizing the importance of knowing a patients' sexual orientation, practices, and gender identity. Mean response from UI students about understanding the unique health risks and needs of LGBT patients was significantly higher than the other schools (4.39; $F(3,721) = 4.159$, $p = .006$). Students disagreed with statements about not needing Pap smears for lesbian patients (1.48), which was comparable across institutions.

Knowledge about access to healthcare overall was 2.72, which indicates slight disagreement. However, upon reviewing responses by institutions, there was a significant difference ($F(3,718) = 8.090$, $p = .000$). UI participants more strongly disagreed (2.38) versus the other three institutions.

Preparedness

Responses to students' perceptions about being prepared to provide healthcare for LGBT individuals were generally positive except for a relatively low level of understanding about transgender terminology (2.89). UI respondents indicated a greater understanding of transgender terminology over the other schools (3.13, $F(3,718) = 7.154$, $p = .000$). WSU respondents indicated less comfort with knowing the unique healthcare risks of LGBT patients in order to take an appropriate history (2.67, $F(3,718) = 5.922$, $p = .001$).

Campus Climate

Survey participants across all institutions perceived their medical schools' learning environment to be accepting of LGBT students with 94.7% stating they had never witnessed (86.9%) or did not know if they had witnessed (7.8%) or experienced bias or discrimination as medical students because of LGBT identification (Table 3). UNMC hade statistically significant low score on campus climate (3.84, $F(3,716) = 21.084$, $p = .000$) also had the most observed episodes of discrimination toward LGBT medical students, including six instances of public criticism and 13 instances of verbal harassment. Statistically significant negative correlations exist between overall climate score and awareness of bias directed against LGBT-identified medical students, faculty, and staff (Table 4).

LGBT Curriculum Inventory

Curricular data were obtained from three institutions. One institution had 3 h of required content (1 h for lecture and 2 h for small group), a second had 4 h (2 h for lecture and

Table 2 Summary of survey items in aggregate for all four institutions (mean ± SD)

	Disagree		Neither agree nor disagree		Agree			
	No.	%	No.	%	No.	%	Mean	SD
Attitudes								
I would feel comfortable treating patients I know are LGBT	15	2.0%	13	1.7%	728	96.3%	4.69	0.66
I would feel comfortable working with a physician or other healthcare professional who I knew identified as LGBT.	17	2.2%	25	3.3%	715	94.5%	4.66	0.71
I would feel comfortable having a physician who identified as LGBT for my own care.	40	5.3%	56	7.4%	659	87.3%	4.45	0.92
I would be comfortable with a family member coming out as lesbian, gay, bisexual, or transgender (LGBT).	79	10.4%	65	8.5%	618	81.1%	4.26	1.10
LGBT parents are as effective as non-LGBT parents at raising children.	110	14.5%	76	10.0%	575	75.6%	4.11	1.28
My experiences with LGBT individuals have positively altered my beliefs about sexuality and gender identity.	49	6.5%	141	18.7%	565	74.8%	4.10	1.00
I regularly encounter LGBT individuals in my daily life.	148	19.5%	149	19.7%	461	60.8%	3.69	1.18
I feel comfortable around people whose gender presentation is ambiguous.	153	20.2%	162	21.4%	443	58.4%	3.56	1.14
When I first meet a patient or colleague, I assume they are heterosexual	140	18.4%	214	28.2%	406	53.4%	3.38	0.96
I have spoken to a friend or family member about what it is like to be LGBT.	250	33.0%	121	16.0%	387	51.1%	3.35	1.40
If I found out that one of my professors or clinical instructors was LGBT, my level of respect for them would increase.	244	32.1%	403	53.1%	112	14.8%	2.75	0.98
My feelings about LGBT individuals match the feelings of the community I grew up in.	391	51.6%	193	25.5%	174	23.0%	2.58	1.19
It is possible for people who identify as LGBT to change their orientation.	413	54.5%	152	20.1%	193	25.5%	2.51	1.39
I would be upset if someone thought I was LGBT.	436	57.4%	143	18.8%	180	23.7%	2.40	1.27
My feelings about LGBT individuals are shaped by my religious or spiritual beliefs.	445	58.6%	117	15.4%	197	26.0%	2.34	1.42
I feel uncomfortable when I see two men holding hands in public.	543	71.5%	90	11.9%	126	16.6%	2.01	1.29
LGBT people are less likely than heterosexual people to be in long-term monogamous relationships.	584	76.8%	110	14.5%	66	8.7%	1.79	1.04
I believe that homosexuality is immoral.	602	79.3%	53	7.0%	104	13.7%	1.71	1.27
I would prefer not to treat patients with gender identity issues	677	89.6%	51	6.7%	28	3.7%	1.45	0.82
I would prefer not to treat patients with minority sexual orientation	711	94.4%	28	3.7%	14	1.9%	1.30	0.66
People who are LGBT should be considered to have a mental health problem.	729	95.8%	18	2.4%	14	1.8%	1.21	0.61
Knowledge								
As a physician, I feel it is important for me to know about my patients' sexual orientation, sexual practices, and gender identity	22	3.1%	56	7.8%	642	89.2%	4.34	0.78
LGBT populations have unique health risks and health needs	17	2.3%	61	8.4%	647	89.2%	4.22	0.73
Most LGBT young people do their first "coming out" to a nonparent adult (e.g., a teacher or doctor)	60	8.3%	355	49.2%	306	42.4%	3.42	0.84
Access to healthcare is the same for LGBT persons as for other members of the population	365	50.6%	159	22.0%	198	27.4%	2.72	1.17
Lesbian patients do not need pap smears as frequently as heterosexual women	667	92.1%	46	6.4%	11	1.5%	1.47	0.70
Preparedness								
I would know what to do if a patient came out as lesbian, gay, bisexual, or transgender.	145	20.1%	181	25.1%	396	54.8%	3.45	1.05
I know how to talk with patients about sexual behaviors other than penile-vaginal intercourse.	183	25.4%	144	20.0%	394	54.6%	3.42	1.14
I know the unique health care risks to take a history of an LGBT patient.	229	31.7%	201	27.8%	292	40.4%	3.14	1.05
I know the appropriate terminology for working with someone who is transgender.	296	41.0%	194	26.9%	232	32.1%	2.89	1.08

"Disagree" is a combination of "Strongly Disagree" and "Disagree" responses

"Agree" is a combination of "Agree" and "Strongly Agree" responses

Mean is based on 1=Strongly Disagree, 2=Disagree, 3=Neither Agree Nor Disagree, 4=Agree, 5=Strongly Agree

1 h each for small group and standardized patient role play), and the third institution had 10 h (2 h for lecture, 4 h for small group, 2 h for standardized patient role play, and another 2 h as part of a course). We found no evidence of a relationship between the number of hours of LGBT curriculum and overall attitudes, knowledge, preparation, and campus climate.

Recommended LGBT Topics

A total of 337 (44.0%) students responded to the two open-ended questions asking for recommendations for curricular change and additions to better prepare students to take care of LGBT patients. Four themes emerged addressing how medical schools can better prepare students. The first was to provide clinical experiences with LGBT patients. This could take the form of authentic or simulated encounters.

> "More practice with simulated patients from LGBT communities. All we had was one during a clinical findings session, but I think it should be incorporated as part of the clinical vignettes used by simulated patients. We need PRACTICE asking those important sexual health questions."

Formal education on LGBT health was the second theme. The students suggested integrating discussions of pathophysiology into existing preclinical case presentations where appropriate. They also recommended dedicated didactics or case-based discussions on LGBT health issues.

> "Medical schools can have more open discussion about the LGBT population. It still feels "taboo," or avoided, even when relevant. There can be more practice with working with LGBT patients (standardized patients). Also, there can be more lecture time devoted to specific LGBT health issues."

Safety of the learning environment was the third theme. This has become an increasingly important issue with accreditation, both in preclinical educational settings as well as required clinical rotations. Recommendations included sensitivity training, presentations by LGBT patients, student support groups, and increased number of LGBT faculty.

> "One of our school clubs recently hosted a presentation on treating LGBT patients and is looking into "Safe Space" ally training. I think both of these are positive measures towards education about working with the LGBT population. Including information about this population in cultural competency discussions (such as during a clinical medicine class) would also be helpful."
> "…the more LGBT instructors and staff members that we can have the better. (In the same vein, I would like to see more African American, Latino, and Native American instructors as well.)"

The final theme related to the second question participants were asked, which was what students should learn in LGBT healthcare. Students recommended a variety of topics they felt would better prepare them to enter practice. Some of these included

> Counseling regarding sexual orientation/coming out:"How to work with patients who are struggling with their sexual orientation and/or identity."
> Appropriate language to use:"I think it is very important to have actual persons who identify as LGBT to come in and talk to us and tell us what they prefer as far as terminology and their specific concerns from their point of view and the ones they want addressed from a healthcare professional's point of view."
> Work place discrimination:"Learning how to tackle the social/psychological stresses that LGBT patients have due to stigma/social discrimination."
> Transgender issues:"I haven't had much experience with transgender patients, so that would be nice in order to be better acquainted with their unique needs and to make sure I use proper terminology."

Discussion

Our findings of a lack of a relationship with attitudes, knowledge, and preparedness when compared to total number of required curricular hours were surprising. Although interpretation and generalizability is limited by the experience of only three institutions, it does suggest that some factors affecting the learning environment may be extra-curricular. Those factors may include the following: number or percentage and visibility of "out" LGBT medical students; students' level of training; overall diversity of the students, faculty, and staff; presence of LGBT student and faculty support groups and safe zone training; and presence and promotion of institutional non-discrimination policies.

We did find there were differences among the schools, with UI having a higher percentage of self-identified "homosexual," "bisexual," or "other" participants than the other schools and UNMC having the lowest. This resulted in distinct differences in responses for the attitudes, knowledge, preparedness, and climate questions.

Although students may not always know what interventions work best, many of the students' suggestions for curricular improvement mirror the findings of other studies, including addressing the specific knowledge deficits in transgender terminology, healthcare needs, and risk factors [4, 5, 7, 8, 13, 17–23]. Burke et al. specifically found that more frequent and positive contacts with LGBT patients along with steps to prevent the decline in empathy that occurs naturally over the 4 years of medical school were most useful in developing positive attitudes [13]. Several areas identified for

improvement by students could be addressed by more clinical exposures to LGBT patients. One student summarized this idea as follows:

> "More than one lecture coverage during clerkship rotations, specific to LGBT populations. We do these during first 2 years but it is easier to forget once we get to clinical practice and actually encounter these patients, then forget/do not give adequate care because we forget key features/factors/questions, etc."

Limitations and Strengths

Limitations of this study include response rates for anonymous surveys, which may represent a selection or response bias for students with special interests in LGBT topics and health concerns. This may be the reason for the low response rate from one of the institutions, who have noted that their students are more responsive when time is taken in class to have students complete surveys. We did not identify the percentage of in-state vs. out-of-state students taking our survey, which may affect the results depending on the number of students from more or less conservative areas of the country. We also did not identify students by year of training, which

Table 4 Correlation of overall campus climate/learning environment with discrimination practices in aggregate for LGBT students and other health professionals at all four institutions

Campus climate/learning environment[a] correlated with discrimination practices[b]	Correlation coefficient (r)	p value
Medical students	− 0.385	< 0.001
Medical faculty	− 0.302	< 0.001
Medical staff	− 0.295	< 0.001
Other healthcare professionals	− 0.329	< 0.001

[a] Responses to the question, "How would you describe the learning environment at your medical school, in relation to acceptance of LGBT students?" on a scale where 1 = very hostile, 5 = very accepting

[b] Responses to the question, "How often have you been made aware of bias or discrimination directed toward the following groups at your medical school, because of their LGBT identification?" on a scale where 1 = never, 5 = frequently

Table 3 Campus climate and discrimination practices in aggregate for LGBT students and other health professionals at all four institutions

	Hostile		Neutral		Accepting			
	No.	%	No.	%	No.	%	Mean	SD
How would you describe the learning environment at your medical school in relation to acceptance of LGBT students?[a]	23	3.2%	117	16.3%	580	80.6%	4.14	0.80
Awareness of bias or discrimination directed toward the following because of LGBT identification:[b]	Never		Neutral		Frequently			
	No.	%	No.	%	No.	%	Mean	SD
Medical students	636	88.6%	53	7.4%	29	4.0%	1.46	0.83
Medical faculty	663	92.6%	41	5.7%	12	1.7%	1.30	0.68
Medical staff	663	93.4%	39	5.5%	8	1.1%	1.26	0.63
Other healthcare professionals	660	93.6%	35	5.0%	10	1.4%	1.27	0.65
Personally witnessed or experienced bias or discrimination directed at medical students because of their LGBT identification:	#	%						
Yes	38	5.4						
No	626	86.9						
Don't know	56	7.8						
Perceived methods used to discriminate against or punish medical students at your school:	#							
Lower performance evaluations	2							
Lower grades	2							
Denied training opportunities	1							
Denied rewards	2							
Publicly criticized	16							
Undesirable work assignments	2							
Verbal harassment	23							

[a] Rating scale: 1 = very hostile, 5 = very accepting

[b] Rating scale: 1 = never, 5 = frequently

could affect results based on the year each institution's required training was offered; change in attitudes and knowledge may occur with additional training. However, the primary purpose of this survey was to explore the attitudes, knowledge, and perceived preparedness for working with LGBT populations in general, which is why we did not feel year of training was an important demographic data point to collect. Future studies will include this to ensure greater granularity of responses may be analyzed.

Another limitation is the lack of generalizability to other Midwestern medical schools because we specifically targeted medical schools in cities with robust LGBT communities, but not large urban areas such as Chicago or Minneapolis. To our knowledge, no other comparisons across comparable cities have occurred in other parts of the USA, which may be a future initiative for our work. Finally, survey items for knowledge and preparedness may not accurately reflect students' knowledge and abilities in those areas. Responses to the knowledge questions may reflect students responding to social expectations or an acceptability bias.

Strengths include findings from Midwestern medical schools, which are not specifically commonly reflected in published literature, relatively large sample size when compared to similar studies (766 students from four institutions), and high rate (44.0%) of students responding to open-ended questions regarding recommendations for curricular change.

Conclusions

Attitudes, knowledge, and preparedness at the four Midwestern institutions as identified in our study were generally positive and bode well for student preparation for the healthcare of LGBT patients. Upon further investigation, it was evident that there were differences across the campuses. Some of this may be the result of a lower proportion of students who self-identified as homosexual, bisexual, or other. Although there were differences in reviewing the responses, the mean responses were not completely at odds, meaning that if it was difference in levels of agreement, all the schools were still in agreement. It just happened that one or more were significantly different.

Issues with campus climate/learning environment for LGBT medical students, while not commonly reported, remain a concern, especially at one institution. Of note, a lower rating of acceptance on campus was also linked to a greater number of instances of students experiencing or witnessing public criticism or harassment because of perceived sexual orientation. In response to open-ended questions for suggestions for improvement, students expressed that the lack of clinical experience with LGBT patients is a major issue, which, if addressed, could enhance not only clinical skills and knowledge but also attitudes.

However, clinical exposures in clerkships may be especially difficult in smaller urban settings such as those in which the schools in our study were located. This concern was also expressed in the report on implementing curricular and institutional change by the AAMC [11]:

> "The geographical location of a clinical rotation could affect the odds that a student will be exposed to a patient who identifies as LGBT, gender nonconforming and/or born with DSD [Differences of Sex Development].Even within urban medical centers, ensuring that every student is exposed to such diversity may be challenging, if not impossible."

Addressing unique LGBT healthcare needs as part of didactics on pathophysiology of disease may normalize the topic as opposed to singling out LGBT topics in special lectures, which is what our curriculum inventory of three institutions involved in this study do. Instead, noting that lesbians have a higher prevalence of heart disease while addressing special populations in a cardiology lecture could be done. A solution to the paucity of clinical exposures to LGBT persons may be accomplished in a simulated setting of the pre-clerkship years in addition to the clinical years through standardized patient encounters. Multiple teaching modalities, such as small group role plays and interactions with LGBT-identified patients, case discussions, and, if possible, one-on-one clinical interactions, are some options [25].

Additional experience and research can tell us whether a mix of pre-clerkship simulation and didactic sessions can successfully train culturally and clinically competent future physicians for when they do encounter LGBT patients in their clerkships and beyond. Future research comparing institutions such as our four Midwestern schools and those in larger, more diverse, metropolitan areas may reveal if significant differences in training opportunities and outcomes truly exist in LGBT healthcare education in different geographical settings.

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Conflict of Interest The authors declare that they have no conflict of interest.

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